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ABSTRACT

A study investigated the use of the semantic webbing technique to improve reading comprehension. The model of a web consists of the core question, the web strands, the supports of the strand, and the strand ties. Subjects, 25 third graders and 26 fourth graders, were assigned to reading ability groups based on past performance, informal testing and teacher evaluation. The reading groups were then randomly assigned to the experimental or control group. Form A of the Stanford Diagnostic Reading Test was used as a pretest while Form B was used as the posttest. Subjects in the control groups worked on reading comprehension using their basal texts and workbooks, while the experimental group worked with comprehension through semantic webbing activities. The results indicated that basal reading series are an effective way of teaching reading, and that semantic webbing is an alternative additional technique. No significant differences were found except in the area of literal comprehension when the students were grouped by achievement levels. The fact that the experimental group did as well as, or even a little better on the adjusted means, than the control group might indicate that semantic webbing is as good as other techniques. Students responded favorably to the technique even though they tired of it when it was presented in a very concentrated format during the study. The students' preference for short answer detail items to the more difficult, thought provoking questions is not unique to semantic webbing, but one characteristic of all reading and writing tasks. (Extensive tables of data are included in the text, and appendixes contain examples of semantic webbing, an outline of the inservice teacher training in use of the technique, and teacher evaluations of the technique.) (HTH)

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A STUDY OF THE USE OF THE SEMANTIC WEBBING TECHNIQUE TO IMPROVE READING COMPREHENSION OF THIRD AND FOURTH GRADERS

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by

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PURPOSE

Presently, comprehension is a major concern to educators, especially to those directly involved in the reading process. Without comprehension, reading is merely a matter of word calling. Numerous researchers are endeavoring to investigate particular commonly-accepted aspects of comprehension and the significance, if any, of each of these to the process of reading. Levin (1976) made reference to the overall comprehenion concern when he stated:

> I . . . focus my attention on the child who can identify the words, knows the meaning of individual words, but has difficulty in integrating the separate meanings into an organized whole. The child . . . possesses average or above average decoding and vocabulary skills, but performs poorly on tasks which involve reading comprehension. (p. 321)

Cromer (1970) labeled this type of reading disability as a "difference" model (p. 471). In this definition, the:

> . . . reading difficulty has been accounted for by a difference, that is, a mismatch between the individual's typical mode of responding and the pattern of responding assumed necessary for adequate reading to occur . . . the individual would read adequately if the material were consistent with his behavior patterns, that is, a change in either the material to be read or in his patterns of responding would result in better reading. (p. 471)

The research of Levin (1972) showed that verbal and imaginal representations that have been incorporated in the materials to be learned have had a positive effect on the performance on the learning tasks. The semantic webbing technique (see page 12 for definition and Appendix A for example) is one that helps the child visually construct the meaningful relationships for comprehending the material read, and therefore, is or could be construed to be a technique closely related to or part of imagery processes that need to be used by a student to enhance his/her comprehension of written material.

The purpose of this study was to investigate the use of the semantic webbing technique to improve the reading comprehension of third and fourth graders. Both levels of reading achievement and grade levels were examined to see if there were specific areas or levels at which semantic webbing as a technique made a significant difference.

SIGNIFICANCE

Literature relevant to the semantic webbing technique may be divided into six major areas. The first concerns the question of whether comprehension is better when story passages are presented in a pictorial mode. Rohwer and Matz (1975) conducted a study of subjects in which one group was comprised of white middle

class population and the other group was representative of a black lower class population. The groups differed substantially in intelligence scores and probably also in reading achievement. For the better readers or the middle class white population the addition of print or pictures to a story that was read to them made little difference in the level of comprehension. For the poorer readers or the lower class blacks, their performance level was as good as the better readers when pictorial representations accompanied the story passages.

Anderson and Hidde (1971) studied the recall of college students to 30 sentences that were rated according to pronunciability or imagery vividness. On a test of recall the imagery-rating group recalled far more sentences and sentence parts.

In another study, Anderson and Kulhavy (1972) found that high school seniors had better reading comprehension when they had used imagery extensively and could recall more of what they had read. Levin (1973) also found that fourth graders who were aided in generating visual images while reading improved comprehension. Levin (1976) concluded that "the training of imagery production in children in need of an organizational framework looms as a reasonable strategy" (p. 237).

The second area deals with active reading comprehension. Durkin (1978) defined reading comprehension as "the fulfillment of a particular purpose through the use of appropriate material that is read in a particular way" (p. 422). This definition assumes that comprehension is an internal, unobservable process and recognizes that the level and amount of comprehension has to be inferred from a reader's behavior. Pearson and Johnson (1978), however, considered reading comprehension to be an active not passive process. They have stated that "the reader cannot help but interpret and alter what he reads in accordance with prior knowledge about the topic under discussion" (p. 24). Farr and Weintraub (1973-74) also stated the concerns of comprehension as a process. They stated:

> Psychologists have been attempting to get a hold on the thinking process for decades . . . Yet, for all their efforts, we still have but a limited understanding of only some of the more superficial behaviors related to thinking . . . we are naive to expect educational research to provide us with answers to teach a specific kind of thinking behavior--reading. (p. 131)

These definitions illustrate the current thoughts regarding reading comprehension. First, reading comprehension is an active process, and second the reader brings experience and information with him/her to apply to the material he/she is reading. Schema theory has emphasized the concept of active comprehension. Thus, further research and theory building are presently receiving attention in the field of reading.

The third area involves schema theory. The term schema came into psychology most directly from Bartlett (1932). His use of the term was attributed to Head (1926). As early as 1787, Kant had anticipated it as a major concept, as reviewed by Rumelhart and Ortony (1977). By 1980, cognitive processes in reading that were receiving emphasis in research were expanded to include the comprehension of story structures, the relating of background knowledge to textual information and reading as a process of information searching (Rumelhart, 1981).

The idea of schema and the related terms of frames, scripts and plans have been emphasized in cognitive science since the mid-1970's. Work by Bobrow and Norman (1975), Moore and Newell (1973), Chafe (1976), Minsky (1975), Rumelhart (1975), Schank (1982) and Winograd (1975) has built evidence for the schema theory. These researchers viewed schemata as the building blocks of cognition.

> Schemata are employed in the process of interpreting sensory data, in retrieving information from memory, in organizing actions, in determining goals and subgoals, in allocating resources and in guiding the flow of processing in the system . Since none of these tasks which schemata are supposed to carry out has reached maturity, it is little wonder that a definitive explication of schemata does not yet exist and that skeptics view theories based on them with some suspicion. (Rumelhart, 1981, p. 4)

Remelhart and Ortoney (1977) listed four major characteristics of schemata. Schemata have variables and can be embedded, one within the other. Schemata represent knowledge at all levels and are not just definitions. Schemata have also been described as being active processes and as recognition devices.

Kintsch (1978) and Kintsch and van Dijk (1978) described a theoretical model of comprehension that stated that comprehension is a constructive process that results from both stimulus from the text and from two important schemata known to the reader. These schemata involve the reader's knowledge of the text's superstructure and the knowledge as to the reader's purpose for reading the text. These schemata become a reader's script for comprehension. Research studies by Anderson, Reynolds, Schallert and Goetz (1977), Bransford, Nitsch and Franks (1977), and Schweller, Brewer and Dahl (1976) have all indicated that schemata are a prerequisite for the correct interpretation while reading.

Schank's (1972) research in artificial intelligence has also had a direct influence on the schema theory of reading. Schank's research involved programming for computers so that these machines could produce paraphrases of texts and could answer questions relating to the text. His first premise was that natural language is conceptual and that the concepts underlying language are meanings, not words.

The whole system of organizing the relationships among concepts has been graphically illustrated by the work of Collins and Quillian (1969) and Lindsay and Norman (1972) as well as others. The basic unit used in this network is the

proposition. Pearson and Johnson (1978) have defined the proposition as "a unitary statement about the world" (p. 40). It can also be thought of as "what we learned to call clauses (dependent or independent) when we took English and grammar classes in school" (Pearson & Johnson, 1978, p. 40). For example, the sentence that reads, "The horse was bitten by a dog." is a proposition. A statement that shows a relationship between two propositions might be, "Because the horse was bitten by a dog, he bolted down the road." Researchers such as Kintsch (1974) and Thorndyke (1977) have also provided evidence to support the idea that propositions are the basic units of thought. Without schemata as organizers for input, new experiences would be incomprehensible (Anderson, 1977).

Schank (1972) suggested that a set of expectations is built based on the text. Only if memory processing structures are not completely adequate does learning take place. Schank (1982) also suggested that scripts are important and further defined their usefulness as:

> We often leave out the obvious connections in a story. We do this as speakers because we assume that the hearer has a script available that will make things sensible. If such a script is not available, however, the hearer (or reader) will be confused. (p. 102)

Bransford and Johnson (1973) found that when appropriate schemata were provided for a text, most subjects had no trouble with comprehension. While schemata were crucial to comprehension, Bruner and Potter (1964) found that if a premature commitment was made to a particular schema, the subjects were less willing to change from their first hypothesis.

Inherent in the schema theory are at least three reasons why incorrect or incomplete comprehension occurs (Rumelhart, 1981). The reader may not have the appropriate schemata; he/she may have the essential schemata but may not have sufficient clues provided by the author or he/she may find a viable interpretation but not the one intended by the author.

McNeil (1980) reported that schema theory of reading comprehension indicates that good readers have a set of "scenarios" in their heads which they utilize as they read. These schemata allow them to process information by relating it to a previous concept or idea. Currently it is presumed that one of the characteristics which separates good readers from poor ones is the availability of more completely developed schemata. Tentative findings indicate, among other things, the importance of teaching the use of schemata for relating reading to prior experience.

In a study of 20 good readers and 20 poor readers at the third grade level, Townsend (1982) had the students listen to two short passages. The comprehension of the second passage required a shift in schemata and only one half of the children were explicitly cued to this shift. Results indicated that good readers recalled more information, but there was a similar flexibility of schema shifting for good and poor readers.

In accordance with the schema theory a reader's background is crucial to comprehension. Pearson and Johnson (1978) have concluded that "the closer the match between the syntactic and semantic information in our heads, the greater the likelihood we will understand the text" (p. 12). Crafton (1983) conducted a study of 30 eleventh graders to examine the effect of students generating their own background information. The experimental group read two texts on the same topic while the control group read unrelated topics. The experimental group consistently focused on larger segments of the text as they read. They generated more inferences, utilized more outside information and related it to the textual material and in general became more personally involved in the reading. This group also retold the text with better organized and longer presentations that included higher level text information. Spilich, Vesonder, Chiesi and Voss (1979) found similar results.

In two classroom studies, Stevens (1980) showed that the possession of prior knowledge significantly aided comprehension of ninth graders. Stevens (1982) also found that direct teaching of background knowledge of a topic resulted in significantly improved reading of the topic by tenth grade boys. Pearson, Hansen and Gordon (1979) found that second graders who had the schema for the passage in their readers read the text significantly better than those who did not have the schema. This finding is further substantiated by Bransford, Nitsch and Franks (1977). Pichert and Anderson (1977) showed that the instructions that readers received influenced the details that were remembered. Royer, Perkins and Konold (1978) found that clues given after reading did not improve recall, while clues given before reading did. Bransford and Johnson (1973) found significant improvements in comprehension and recall due to prior knowledge of the topic. They found also that relevant knowledge must be activated before reading if comprehension is to occur.

Lipson (1982) found that prior knowledge was a most influential factor on reading comprehension for both average and poor readers. Both groups were better at obtaining new information than in correcting old information. Even when prior knowledge contradicted the text, the subjects continued to use past knowledge rather than text information. Only when they did not have prior information or did not believe they had, did they resort to the text.

Another area of concern is how schema theory related to child development and brain specialization. Since reading is a part of the thinking process, input from child development is essential. Piaget (Labinowicz, 1980) stated that logic precedes language and is deeper than language. He further stated, "Language is the most complex and abstract mode of representation" (Labinowicz, 1980). Symbols of language bear no resemblance to the objects or events that they represent. Therefore, a word or phrase has no meaning unless the meaning is based upon prior experiences. The existing thinking framework must give meaning to words. Piaget

(Sime, 1973) labeled the framework in which concepts are stored in people's minds as schemata. He then used the word "assimilation" for the process of absorbing an experience into the schemata and "accommodation" for the process of adaptation of a new experience and the need to alter current schemata.

During the 1960's some major hypotheses and studies began to form a more solid basis for later studies in brain specialization. Today these findings are seen as important beginnings of major brain theories regarding the two hemispheres and their specialized functions. Hacaen and Angelergues found that the right hemisphere had a special function in the appreciation of space and the recognition of faces (Ornstein, 1973). Palmer (1975) also found that while a face may be clearly identifiable the parts are not when they are out of context. The parts had to have enough internal schema or structure to be recognizable within their own right.

From studies in brain specialization, the left hemisphere (Ornstein, 1972) has been found to be the dominant brain with analytical, logical thinking especially in verbal and mathematical functions. This brain uses a linear mode and processes information sequentially. Since logic depends on sequence and order, this hemisphere is dominant in logical thought. Both language and mathematics depend on linear time.

Overall, the right hemisphere seems to be specialized for holistic mentation. Zaidel (Brain/Mind Bulletin, November, 1975) found that the right hemisphere is strongest in passive comprehension and has a higher threshold for retrieval. According to Ornstein (1972), the right brain processes information more diffusely than the left hemisphere. It processes the whole for a more instantaneous reading of the parts and the integration of many inputs is critical (Ornstein, 1972). While each hemisphere of the brain may have strengths, higher level thinking skills that utilize divergent thinking probably need both cerebral hemispheres actively contributing and communicating (Willems & Brown, 1980).

Schema theory and vocabulary development are also a major area of reading comprehension. Currently one of three hypotheses of vocabulary development is known as the knowledge hypothesis (Johnson, Toms-Bronowski & Pittelman, 1982). This hypothesis is concerned with the relationship of stored word knowledge to the comprehension of discourse. In this theory, the knowledge that a person brings to the task of comprehending the text provides the framework in which word knowledge functions. Prior knowledge is viewed as crucial to understanding the text. Studies by Kintsch (1977) and van Dijk (1977) have added support to the knowledge hypothesis for vocabulary development.

Conclusions of Manzo and Sherk (1971-72) favor the knowledge approach to vocabulary development.

> If we think of word learning as an extenion of basic language learning, teaching vocabulary may be a relatively simple matter of exploiting experiences as a means of teaching vocabulary and exploiting and using vocabulary as a means of getting the most from experience. (p. 88)

The idea of exploiting experiences as a way of teaching vocabulary is not new. Many writers including Carroll (1964), Dale (1965) and Dolch (1953) have stressed the importance of providing experiences for children and using these as a basis for vocabulary development.

Based on the recent information-processing theories of Collins and Quillian (1969), Lindsay and Norman (1972) and Massaro (1975), the importance of prior knowledge and the way in which it is stored and retrieved has placed a new emphasis on vocabulary teaching and a new focus on vocabulary research. Bousfield (1953) found that a phenomenon termed "clustering" was found when students were given a list of randomly arranged items. A sequence of associations were essential to the relationship of the items recalled. This finding was followed up with studies by Bower, Lesgold and Tieman (1969), Perfetti and Goodman (1970) and Tulving and Pearlstone (1966).

From the information-processing hypotheses by Collins and Quillian (1969, 1970), two processes are represented by the Subway Map and the Spreading Activation Models (Collins & Quillian, 1970). Using the Subway Map Model, a subject would make use of the path of least resistance through memory structures to answer a given question. If there were not enough word-concept links, the subject would not be able to make an inference about the statement. According to Collins and Quillian (1970), the Spreading Activation Model would add a facilitating effect. This model suggests that related nodes or links of mental processing would be alerted as the subject processes an association. The model indicates that a second sentence about a given subject would be processed quicker than an unrelated sentence. See Figure 1 (Collins & Quillian, 1969).

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Figure 1. Spreading Activation Model: Illustration of the hypothetical memory

In a 1975 study, Collins and Loftus reinforced the idea that a spreading activation type of process does occur when a subject processes words, sentences and prose.

Johnson, Toms-Bronowski and Pittelman (1982) stated that new vocabulary words must activate categorical relationships within the reader's word knowledge if the new vocabulary is to be learned. Research has suggested that strategies that are based on conceptual frameworks would help the student retrieve known words both in isolation and context. If this categorization is used by readers, then new words should be learned in the same way. Semantic mapping is one way to categorically structure information graphically. This procedure (Johnson & Pearson, 1978) is individualized in that each student relates new words to his/her own experiences and prior knowledge.

Johnson, Toms-Bronowski and Pittelman (1982) found that semantic mapping and semantic feature analysis were both effective strategies for teaching vocabulary when varying populations of over 1,000 intermediate grade level students were used. Four months later, long-term retention was assessed and these statistics showed that these two strategies were significantly higher than contextual analysis (Johnson, in press). In 1981, a parallel study to this one was done in the Republic of China. This study also validated the effectiveness of semantic mapping and semantic feature analysis (Johnson, Pittelman, Toms-Bronowski, Chu-Chang, Tsuui, Chun Yin, Ying Chien & Chin, 1982). In the spring of 1983, Johnson (in press) began a series of studies to investigate the effectiveness of semantic mapping and semantic feature analysis as techniques for prereading instruction for passage comprehension. The effectiveness of semantic-based vocabulary instruction has been supported by experts in this field as evidenced in their writings (Johnson & Pearson, 1978; Pearson & Johnson, 1978; Smith & Barrett, 1979; Smith & Johnson, 1980).

The same criteria found for semantic mapping are found in a similar technique known as semantic webbing. Although it is basically a way of graphically showing understanding, hopefully, it is also a way to look at the schematic processes the reader used to comprehend the reading selection. Wittrock et al. (1975) concluded that comprehension is aided when the learners elaborate on what they have read and that there is value in helping them build mental pictures of what they have read. Semantic webbing has been defined by Freedman and Reynolds (1980) as "a process of organizing and integrating information that underlies many theories of conceptual thinking and instructional models and programs" (p. 677). Operationally, it is a "process for constructing visual displays of categories and their relationships" (Freedman & Reynolds, 1980, p. 677).

There are few guidelines and strategies available to the teacher to help the student graphically apply his/her prior knowledge to reading tasks. The absence of techniques is especially true in the elementary reading program. Most, if not all, work has been done in middle schools and at secondary levels. Some content area work has also occurred. Research is desperately needed to validate these techniques.

Langer (1981, 1982) developed a prereading plan, PRep, that is a three-step assignment and instructional procedure that was designed to be used prior to reading a textbook. The importance of this plan is that it helps the teacher assess any prior knowledge the reader has and how it is organized. The teacher also becomes more aware of the language of the student and can make judgments as to how much more information or vocabulary is needed.

Thelen (1982) developed another model for preparing the students for reading assignments. Thelen combined the structured overview format and concept attainment to help the students organize their prior knowledge, to fill any gaps in their background and to relate their experiences with the new content.

Thoman and Robinson (1977) developed the PQ4R study procedure for stimulating the student's prior knowledge. The technique utilizes the preview, question, read, reflect and review format. The preview stage in particular supports the schema theory of reading comprehension.

Norton (1982) used the webbing technique in university classes to help students plan literature units that they will teach. See Figure 2 (Norton, 1982, p. 350). Hennings (1982) used a structures approach to teach writing through which reading comprehension is addressed. See Figure 3 (Hennings, 1982, p. 16).

Although schema theory and the need for prior knowledge have been accepted into reading instruction materials, little research has been conducted on specific techniques that might help build vocabulary and increase comprehension. Some strategies are being promoted, but without a data base as to their effectiveness. Johnson is probably the most actively involved researcher in semantic mapping. The area of semantic webbing is still undocumented. The gap between theory and the classroom needs to be reduced, if possible. The information basis of brain specialization and the stages of child development must become important in reading instruction. If a graphically designed technique will help some students use their preferred mode of learning, then we have accomplished a little more in the complex task of reading instruction.

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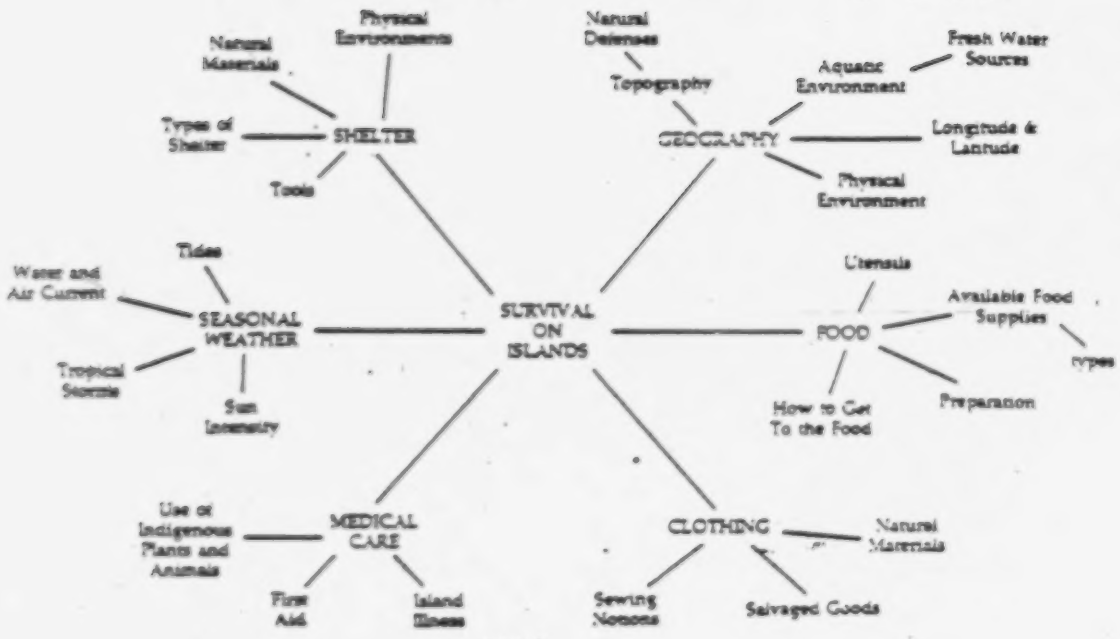


Figure 2. Survival on Islands Web.

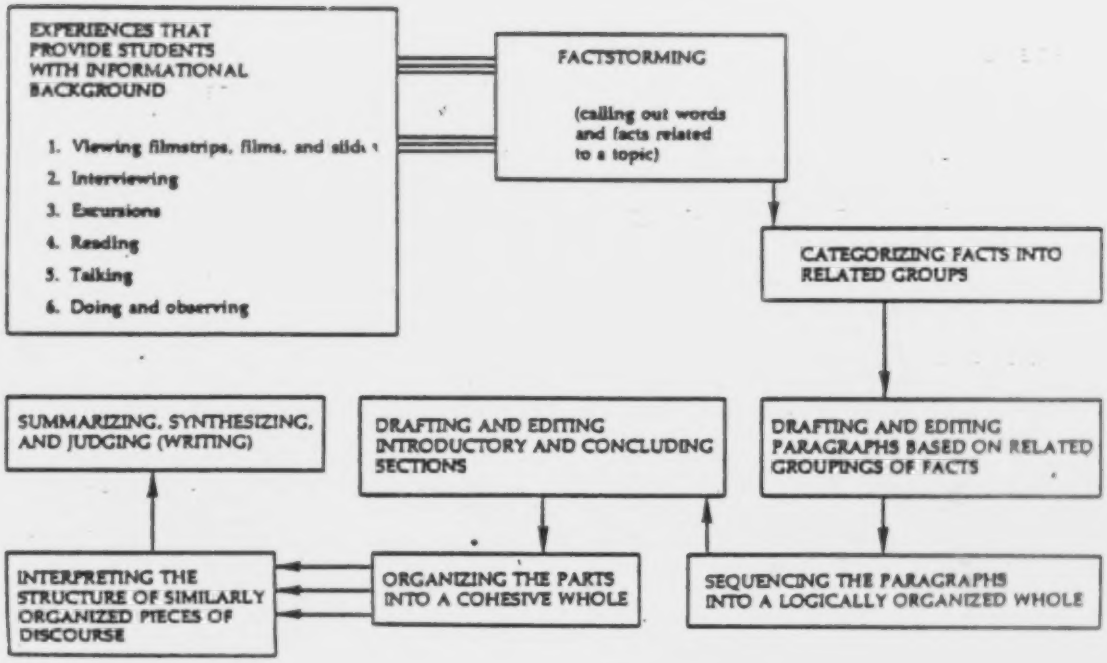

EXPERIENCES THAT PROVIDE STUDENTS WITH INFORMATIONAL BACKGROUND
1. Viewing filmstrips, films, and slid
2. Interviewing
3. Excursions
4. Reading
5. Talking
6. Doing and observing
FACTSTORMING
(calling out words and facts related to a topic)
CATEGORIZING FACTS INTO RELATED GROUPS
DRAFTING AND EDITING PARAGRAPHS BASED ON RELATED GROUPINGS OF FACTS
DRAFTING AND EDITING INTRODUCTORY AND CONCLUDING SECTIONS
SUMMARIZING, SYNTHESIZING, AND JUDGING (WRITING)
SEQUENCING THE PARAGRAPHS INTO A LOGICALLY ORGANIZED WHOLE
ORGANIZING THE PARTS INTO A COHESIVE WHOLE
INTERPRETING THE STRUCTURE OF SIMILARLY ORGANIZED PIECES OF DISCOURSE

Figure 3. A sequence of instructional strategies for building understanding of how informational content is structured.

LIMITATIONS

The findings of this study are limited in the extent to which they can be generalized. The sample for investigation was the third and fourth grade students at University School. The students represented mostly the middle class socioeconomic level, and may or may not represent students in Wyoming or other areas. Since the findings were not cross validated on other populations, conclusions drawn from the findings are limited to other populations similar to the sample.

The comprehension subtests of the Stanford Diagnostic Reading Tests, Forms A and B, were used. The study was also limited by these two tests. These subtests were chosen because they provided samples of the type of comprehension strategies that are pertinent to this study and are widely used reading tests that give subtests on literal comprehension and on inferential comprehension. Conclusions drawn from this study are limited to comprehension as measured by these two tests, and any extension of the conclusions to other instruments must consider similarities between the instruments.

DEFINITION OF TERMS

The following terms will be used throughout the report and need to be clarified:

Semantic Web - (see Appendix A). The basic model of a web (Freedman & Reynolds, 1980) consists of the core question, the web strands, the supports of the strand and the strand ties. The core question which is usually given as guidance by the teacher for the silent reading activities provides the focus of the information to be gathered. The web strands are the possible answers given by the students. The supports are facts, generalizations and inferences from the story that add clarity or more information to the web strands. The strand ties show any relationships that may exist among the strands.

Semantic Mapping. Semantic mapping is a structuring of information in graphic form. The student relates new words to the prior knowledge she/he possesses. Johnson et al. (1982) described five steps that must occur in the semantic mapping technique. First, a word or topic is selected. Second, the teacher writes the word on the chalkboard. Third, the students are asked to think of all the words they can that are related to the selected word. As they jot down the words on paper, they put them in categories. For younger children, this process may be an oral discussion among students and the teacher, with the teacher doing the writing. Fourth, the students share the words which are written on the board in categories. Last, the students title each category, and general discussion follows. (See Appendix B.)

Literal Comprehension. In the Stanford Diagnostic Reading Test (1976), the term literal comprehension refers to the students' ability to understand what is explicitly stated within each passage (p. 61).

Inferential Comprehension. As tested by the Stanford Diagnostic Reading Test (1976), inferential comprehension includes the students' ability to make inferences, draw conclusions, predict outcomes, evaluate situations, see cause and effect relationships, make comparisons and contrasts, understand characterization, verify the truthfulness or relevancy of statements and understand the author's purpose, bias, tone or mood (p. 61).

Schemata. The plural form of the network or link (Pearson & Johnson, 1978) between concepts or propositions as students use prior knowledge to understand reading material.

Schema. The singular form of the coneptual network.

Semantic Feature Analysis. The strategy of semantic feature analysis (Johnson & Pearson, 1978) focuses upon the ways in which words within a given category are alike or different. (See Appendix C.)

DESIGN OF THE STUDY

Population and Selection of the Sample

This investigation was conducted in University School at the University of Wyoming with third and fourth graders. Students at University School come from the city of Laramie as well as the county of Albany. Selection for each class was made from the pool of applications for each grade level. Efforts were made to keep each grade level as representative of the area as possible. Factors such as parent occupation, achievement level, learning profile, sex and background were considered. At the time of this study, a nominal tuition fee of $10.00 per semester did not preclude anyone from attending the school for financial reasons. Only one class of each grade level existed at the time of the study. The entire class of each grade level was used in the project. The majority of the children represented the middle socioeconomic class. Of the 25 third graders, five were from the lower socioeconomic class, while 20 were from the middle class. In the fourth grade group, nine of the students were from the lower class, while 17 were from the middle class. The federal guidelines based on income for free milk and lunch programs was used to determine the division between middle and lower class. Although the majority of the students were Caucasian, one student was Native American, one was black, one was Eskimo and two were from foreign countries. No subjects were dropped.

Subjects in the third and fourth grade levels were selected for the study for several reasons. First, students of this age take achievement tests much more easily than do younger children. There should be less interference from the testing situation than may be true for younger children. Second, for the "average" child the basic process of learning to read is usually complete around the third grade. At this time, the youngsters have the skills to zero in to comprehension and to various methods of organizing materials. Third, techniques based on semantic mapping and webbing are currently being used in content areas. If these techniques are important at the intermediate levels and beyond, the question becomes one of whether these techniques should have been part of the basic reading program prior to application to other areas. Fourth, by third and fourth grade levels, teachers have often quit using as many visual aids as they did when the students were less able to read. This study was conducted specifically to see if a visual technique did increase comprehension.

MEASURES USED

Reading comprehension subtests in Forms A and B of the Stanford Diagnostic Reading Test (SDRT) were used as the pretest and posttest, respectively. The posttest was given within two weeks of the conclusion of the study. Subjective data were collected from each teacher at the end of the study. The investigator asked each teacher to report reactions of the students and her reactions as the teacher to the webbing technique as it was used in the study. No specific instrument was used, but rather left open-ended so that teachers were free to give any and all comments.

The Stanford Diagnostic Reading Test

The Stanford Diagnostic Reading Test is currently a widely accepted achievement measure that is used in schools throughout the nation. Validity and reliability for this test are detailed in the Manual for Administering and Interpreting (Karlsen, Madden & Gardner, 1976). The validity and reliability of the subtests are summarized in a later section of this unit.

Three types of norms--percentile, stanine and grade equivalent--are provided. The normative sample was chosen to be representative of the national school population. A stratified random sampling technique was used to select school systems. Socioeconomic status, school-system enrollment and geographic area were treated as the stratification variables. A sample of 3,000 elementary (K-8) and unified (K-12) districts were used.

The subtest of concern in the present study was the Reading Comprehension Test. This reading comprehension subtest is divided into two parts, literal and inferential

comprehension. Both literal and inferential comprehension are presented in a multiple-choice cloze format and by short passages followed by questions. The Dale-Chall Readability Formula was used to determine appropriate reading levels. The literal comprehension subtest evaluates the student's ability to understand explicitly stated information. The inferential comprehension subtest evaluates the student's ability to make inferences, draw conclusions, evaluate situations, predict outcomes, see cause and effect relationships, make comparisons and contrasts, understand characterization, verify the truthfulness or relevancy of statements and understand the author's purpose, bias, tone or mood.

RELIABILITY OF SUBTESTS

Kuder Richardson Formula #20 was used to determine the reliability of the SDRT scores. Table I shows the reliability coefficients for total comprehension scores, for literal comprehension scores and for inferential comprehension scores for both third and fourth graders.

VALIDITY OF SUBTESTS

The SDRT is considered to have content validity in that it measures the objectives that are reflected in the content of reading programs that are commonly used throughout the country. The criterion-related validity was determined by measuring the intercorrelations between the scores on the SDRT and the scores on comparable subtests of the Stanford Reading Tests. The size of this sample was 1,317 fourth-grade pupils. The correlation between the SDRT total reading comprehension score and the reading comprehension subtest of the Stanford Reading Tests was .90. The correlation for the literal comprehension subtest was .87, and was .90 for the inferential comprehension.

PROCEDURE OF THE STUDY

The students were assigned to reading groups according to their reading ability as determined by past performance, informal testing and teacher evaluation of daily achievement. The reading groups were then randomly assigned to the experimental or control group. Three major levels of reading achievement--above grade level, at grade level and below grade level--were represented in both the experimental and control groups. Above grade level reading achievement was identified as any student who was one year or more above current grade placement. Below grade level achievement was defined as anyone that read one or more years below current grade level. All subjects were pretested and posttested with the same instruments. Form A of

Table 1

Reliability Coefficients for SDRT Scores

Grade and Subtest	Form A	Form B
Grade 3		
Reading Comprehension	.96	.96
Literal Comprehension	.93	.93
Inferential Comprehension	.90	.91
Grade 4		
Reading Comprehension	.96	.96
Literal Comprehension	.93	.92
Inferential Comprehension	.91	.91

the Stanford Diagnostic Reading Test was used as a pretest, while Form B was used as the posttest. The investigator conducted all of the testing situations in grade level sessions. The test directions and time lines were followed as outlined in the Manual for Administering and Interpreting. The investigator also scored all pretests and posttests.

Six teachers were involved in the study, and each had both an experimental group and a control group. The investigator inserviced all teachers relative to the techniques that involve semantic webbing and was also available to answer questions throughout the study (see Appendix D). The subjects in both the experimental and control groups were in one of three basals--Allyn and Bacon Pathfinder Series, Addison and Wesley Reading Program and Harcourt, Brace Reading Series. Materials from all three programs were used by students in each of the achievement levels. The entire reading program for University School is based upon a complete set of objectives written by the faculty and administrators with input from reading specialists both within the University and outside. The subjects in the control group worked on reading comprehension using the materials found in their basal texts and workbooks, while the experimental group worked with comprehension through activities involving semantic webbing. Examples of the materials used are included in Appendix E. Each example correlates to a specific selection that was read. The actual instruction time was three times a week for a six-week period. Each instructional period lasted approximately 20 to 30 minutes. The control group used the same amount of time doing the comprehension activities provided by the basal program.

For each experimental group the teacher introduced a lesson by giving some background for the selection to be read and then introducing the webbing process to be used that day. The process included the comprehension questions that were to be answered after reading was completed. During the silent reading period the students were encouraged to jot down their responses to the comprehension questions. After a silent reading period, the students and teacher discussed the selection and the students' responses. As an alternative, sometimes the teachers and students discussed the webbing process as a group after the silent reading period and answered the questions orally as the teacher recorded the responses on the chalkboard. The examples of materials in Appendix D illustrate the various ways the teachers used to help the students visually construct relationships of ideas found in each selection. Since these students had not had previous experience with semantic webbing, they were not ready to use all parts of the web in a formal way. The level of strand ties was used only in discussion between the teacher and students after individual students had worked on their own copies. The terminology of the webbing was not emphasized in lessons, but rather the visual process showing story interrelationships.

STATISTICAL ANALYSIS

An analysis of covariance using the posttest as criterion and covarying on the pretest was used.

Table 2 shows in graphic form the basic design analyzing the main effects of treatment and grade level.

Table 2

The Experimental Design for Main Effects of Treatment and Grade Level

	Experimental	Control
Grade 3	n = 13	n = 12
Grade 4	n = 12	n = 14

Table 3 illustrates the design analyzing the main effects of treatment and levels of reading achievement.

Table 3

The Experimental Design for Main Effects of Treatment and Levels of Reading Achievement

	Experimental	Control
High	n = 8	n = 6
Middle	n = 9	n = 9
Low	n = 8	n = 11

HYPOTHESES

Reading comprehension was measured by three variables--literal comprehension, inferential comprehension and total comprehension. The null hypotheses for the study were:

1. There will be no significant difference between experimental and control groups in the mean scores of reading comprehension.
2. There will be no significant difference between third graders and fourth graders in the mean scores of reading comprehension.
3. There will be no significant grade level by treatment interaction in reading comprehension scores.

4. There will be no significant difference between the low reading achievement group, average reading achievement group and high reading achievement group in the mean scores of reading comprehension.
5. There will be no significant reading achievement by treatment interaction in reading comprehension scores.

ANALYSIS OF THE DATA

Each of the major hypotheses will be treated as a question to which the analysis of the data provides an answer.

I. Was there a significant difference in mean scores on reading comprehension between experimental and control groups? The answer is no. Although the difference was not significant at the .05 level, the experimental group had an adjusted posttest mean that was slightly higher in all three comprehension areas--literal, inferential, and total. This difference was greater on the inferential comprehension criterion than on the other two. This difference is shown in Table 5 with an F test statistic of 1.38. A difference is also shown in Table II with an F test statistic of 1.19 when reading achievement was an independent variable. The analyses of variance are included in Tables 4, 5 and 6, while the means and standard deviations for the experimental and control groups are given in Tables 7, 8 and 9.

II. Was there a significant difference in mean scores between third and fourth graders in reading comprehension? The answer is no. While the differences were not significant at the .05 level, the third graders scored higher in inferential comprehension and total comprehension, while the fourth graders scored only .04 of a point higher on the literal test. The difference on inferential comprehension was greater than on literal comprehension and total comprehension. This is shown in an F statistic of 1.21 in Table 5. Tables 4, 5 and 6 show the analyses of variance for the grade level groups, while Tables 7, 8 and 9 contain the means and standard deviations.

III. Was there a significant interaction on reading comprehension between grade level and treatment? The answer is no. No difference was found in any of the three reading areas at the .05 level. The F statistic in all three areas was .02. The analyses of variance are shown in Tables 4, 5 and 6.

IV. Was there a significant difference between the low reading achievement group, the average reading achievement group and the high reading achievement group? The answer is yes. There was no significant difference on inferential comprehension or on total comprehension; however, there was a significant difference on literal comprehension at the .05 level. A Scheffe post hoc comparison was done. The data

Table 4

Group by Grade Level Analysis of Covariance for Literal Comprehension Posttest Covarying on Literal Comprehension Pretest

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Group	1	.200	.201	.01
Grade Level	1	.024	.024	.00
Group x Grade Level	1	.279	.279	.02
Error	46	850.552	18.490	

Table 5

Group by Grade Level Analysis of Covariance for Inferential Comprehension Posttest Covarying on Inferential Comprehension Pretest

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Group	1	13.535	13.535	1.38
Grade Level	1	11.822	11.822	1.21
Group x Grade Level	1	.235	.235	.02
Error	46	450.154	9.786	

Table 6

Group by Grade Level Analysis of Covariance for Total Comprehension Posttest Covarying on Total Comprehension Pretest

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Group	1	18.156	18.155	.41
Grade	1	7.931	7.931	.18
Group x Grade Level	1	.884	.884	.02
Error	46	2031.003	44.152	

Table 7

Means, Standard Deviations of Samples for Group by Grade Level on Literal Comprehension

Group	Grade	Number	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Adjusted Posttest
Control	3	12	27.67	2.27	27.08	4.01	25.99
Control	4	14	24.21	9.21	25.07	6.87	26.19
Experimental	3	13	25.54	6.68	26.00	6.39	26.27
Experimental	4	12	26.75	2.83	26.67	5.28	26.16
Control	Total	26	25.81		26.00		26.10
Experimental	Total	25	26.12		26.32		26.22
Total	3	25	26.65		26.52		26.14
Total	4	26	25.38		25.81		26.18
Total	Group	51	25.96		26.16		26.16

Table 8

Means, Standard Deviations of Samples for Group by Grade Level on Inferential Comprehension

Group	Grade	Number	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Adjusted Posttest
Control	3	12	25.42	4.23	26.92	3.18	25.76
Control	4	14	23.64	6.44	24.57	6.10	24.66
Experimental	3	13	22.92	6.50	26.08	5.14	26.67
Experimental	4	12	23.17	4.90	25.42	5.02	25.84
Control	Total	26	24.46		25.65		25.17
Experimental	Total	25	23.04		25.76		26.27
Total	3	25	24.12		26.48		26.23
Total	4	26	23.42		24.96		25.21
Total	Group	51	23.76		25.71		25.71

Table 9

Means, Standard Deviations of Samples for Group by Grade Level on Total Comprehension

Group	Grade	Number	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Adjusted Posttest
Control	3	12	53.08	6.20	54.00	7.01	51.54
Control	4	14	47.86	15.28	49.64	12.78	51.01
Experimental	3	13	48.46	12.89	52.08	11.27	53.00
Experimental	3	12	49.92	7.51	52.08	10.03	51.94
Control	Total	26	50.27		51.65		51.26
Experimental	Total	25	49.16		52.08		52.49
Total	3	25	50.68		53.00		52.30
Total	4	26	48.81		50.77		51.44
Total	Group	51	49.73		51.86		51.86

from the Scheffe post hoc comparison rejected the null hypothesis that the adjusted mean of the high group was equal to the adjusted mean of the low group. The comparison did not reject the hypothesis that the adjusted mean of the high group was equal to the adjusted mean of the medium group, nor did it reject the hypothesis that the adjusted mean of the medium group was equal to the adjusted mean of the low group. Although the differences for reading achievement levels were not significant, the difference for total comprehension was greater, as shown by an F statistic of 1.37 in Table 12. Tables 10, 11 and 12 contain the analyses of variance for the achievement levels. Tables 13, 14 and 15 show the means and standard deviations of the low, medium and high achievement groups.

V. Was there a significant interaction on reading comprehension between treatment and reading achievement level? The answer is no. The interactions were not significant at the .05 level. Tables 10, 11 and 12 contain the supporting data.

SUBJECTIVE DATA

Because the semantic webbing reading technique has only begun to receive attention in research, the investigator asked each of the six teachers to make a subjective evaluation regarding her reactions to the webbing procedure and the students' reactions. In summary, the evaluations indicated that the students liked the technique but grew tired of it as time went on. While most teachers felt that various levels of students liked webbing, two specifically stated that the more capable students liked it better than those in the lower or middle achievement groups. The teachers indicated that they liked the technique and would probably continue to use it as one technique to teach comprehension. The complete evaluations of the six teachers are reported in Appendix F.

Summary of the Findings

1. No significant differences were found between the experimental and control groups on the adjusted posttest scores; however, the experimental group did score higher on the posttests in all three comprehension areas.
2. No significant differences were found between grade level groups.
3. When the groups were divided by reading achievement level, a significant difference was found in literal comprehension. However, further statistical analysis showed that the only difference was between the high achievement group and the low achievement group, with the higher group showing more growth. This is not an unexpected result.
4. There were no significant interactions between treatment and grade level or between treatment and reading achievement levels.
5. The subjective comments from the teachers involved in the study indicated that the technique was quite acceptable and had possibilities for use in

Table 10

Group by Reading Achievement Level Analysis of Covariance for Literal Comprehension Posttest Covarying on Literal Comprehension Pretest

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Group	1	.669	.669	.04
Reading Level	2	114.663	57.332	3.43*
Group x Reading Level	2	.094	.047	.00
Error	44	736.182	16.731	

*Significant at the .05 level

Table 11

Group by Reading Achievement Level Analysis of Covariance for Inferential Comprehension Posttest Covarying on Inferential Comprehension Pretest

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Group	1	12.273	12.273	1.19
Reading Level	2	4.084	2.042	.20
Group x Reading Level	2	3.758	1.880	.18
Error	44	454.523	10.330	

Table 12

Group by Reading Achievement Level Analysis of Covariance for Total Comprehension Posttest Covarying on Total Comprehension Pretest

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Group	1	7.674	7.674	.18
Reading Level	2	119.239	59.620	1.37
Group x Reading Level	2	7.535	3.768	.09
Error	44	1913.289	43.484	

Table 13

Means, Standard Deviations of Samples for Group by Reading Achievement on Literal Comprehension

Group	Reading Level	Number	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Adjusted Posttest
Control	High	6	28.50	1.38	29.50	.55	28.11
Control	Medium	9	28.22	1.48	28.22	1.56	26.99
Control	Low	11	22.36	9.91	22.27	7.24	24.24
Experimental	High	8	28.25	1.58	29.00	1.41	27.75
Experimental	Medium	9	25.44	7.04	26.56	7.02	26.84
Experimental	Low	8	24.75	4.83	23.38	6.05	24.04
Control	Total	26	25.81		26.00		26.09
Experimental	Total	25	26.12		26.32		26.16
Total	High	14	28.36		29.21		27.90
Total	Medium	18	26.83		27.39		26.92
Total	Low	19	23.37		22.74		24.16
Total	Group	51	25.96		26.16		26.16

Table 14

Means, Standard Deviations of Samples for Group by Reading Achievement on Inferential Comprehension

Group	Reading Level	Number	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Adjusted Posttest
Control	High	6	29.17	.75	29.00	1.55	25.36
Control	Medium	9	26.00	2.29	26.67	2.29	25.16
Control	Low	11	20.64	6.30	23.00	6.50	25.11
Experimental	High	8	26.13	1.73	28.38	1.85	26.78
Experimental	Medium	9	23.78	5.80	26.56	4.64	26.55
Experimental	Low	8	19.13	6.29	22.25	5.87	25.38
Control	Total	26	24.46		25.66		25.19
Experimental	Total	25	23.04		25.76		26.25
Total	High	14	27.43		28.65		26.17
Total	Medium	18	24.89		26.62		25.86
Total	Low	19	20.00		22.68		25.22
Total	Group	51	23.77		25.71		25.71

Table 15

Means, Standard Deviations of Samples for Group by Reading Achievement on Total Comprehension

Group	Reading Level	Number	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Adjusted Posttest
Control	High	6	57.67	1.51	58.50	1.98	53.22
Control	Medium	9	54.22	3.19	54.89	3.62	51.90
Control	Low	11	43.00	15.79	45.27	13.56	49.75
Experimental	High	8	54.38	2.83	57.38	3.11	54.28
Experimental	Medium	9	49.22	12.70	53.11	11.53	53.45
Experimental	Low	8	43.88	10.97	45.63	11.55	49.52
Control	Total	26	50.27		51.65		51.30
Experimental	Total	25	49.16		52.08		52.46
Total	High	14	55.79		57.86		53.83
Total	Medium	18	51.72		54.00		52.68
Total	Low	19	43.37		45.42		49.65
Total	Group	51	49.73		51.86		51.87

reading instruction programs. They recommended that it should be one way to teach comprehension, but not the only way. There was some feeling that the students tended to tire of the technique if it was used too often.

Caution in Interpreting the Findings

Random assignment to experimental and control groups was used to help insure internal validity. Since the study was conducted for a six-week period, history was not a factor. The control group should have helped control for subject maturation. Testing and instrumentation were not a problem. The testing measures were not designed especially for semantic webbing techniques, but, rather, to test reading comprehension. This procedure put the effects of semantic webbing on the same plane as the effect of other teaching techniques during the evaluative process. The posttest scores adjusted for the pretest difference between the groups. There was no subject mortality.

Some limitations may be found in external validity. The sample is limited to mainly Caucasian, middle class students; however, this population would be found in other locales. The reading program used by these students is comparable to other schools that use basal readers and group students for reading instruction. The Hawthorn effect should be minimal. The students at University School are used to being involved in different learning experiences. The students knew that some reading practices were being evaluated, but they did not know specifically which groups were experimental and which were control. The experimental effect was controlled by having each teacher have both experimental groups and control groups; however, both experimental groups and control groups were in each teacher's classroom area. The fact that some groups were reading the same story could have influenced another group; hopefully, this carryover was kept to a minimum if it did occur. Within University School each teacher worked in a large open area. Each group had a work area complete with chalkboard, tables, chairs and supplies. The teachers moved from group to group for instruction and gave completely separate written and oral directions. College practicum students worked as aides also. Within this environment groups paid little, if any, attention to each other. The experimenter did all the inservice and all of the testing in a classroom situation. Only short term achievement was measured. The tests used are commonly-used evaluative measures in public schools. The number of students used in the study was small when compared to many other studies. Studies need to be done that include more students.

Any conclusions drawn from this study must be evaluated with the knowledge of the limitations and the data that were collected.

CONCLUSIONS

The investigator reached the following conclusions:

1. Semantic webbing is as good as other comprehension techniques and, therefore, is worth pursuing and developing with classroom teachers. Basically no significant differences were found except in the area of literal comprehension when the students were groups by achievement levels. Only the difference between the high reading achievement group and the low tested significant. This finding could be expected and indicates only that the high group did much better than the low group. The fact that the experimental group did as well or even a little better on the adjusted means as the control group might indicate that semantic webbing is as good as other techniques.
2. A basal reading program is indeed an effective way of teaching reading and semantic webbing is an alternative additional technique. In all areas except one, the subjects as total groups by treatment, grade level and reading levels showed growth in comprehension scores from the pretest to the posttest. The only decrease was by the low reading achievement control group in literal comprehension. This loss was only .63 of a point, which is probably not a loss at all but rather the lack of measurable gain. This performance was measured in just a six-week time period.
3. The students did respond favorably to the technique even though they tired of it when it was presented in a very concentrated format during the study. The students' response of preferring the short answer detail item to the more difficult, thought-provoking questions is not unique to semantic webbing, but one that invades all reading and writing tasks.

EDUCATIONAL IMPLICATION AND SUGGESTIONS FOR FURTHER RESEARCH

The proponents of schema theory have been amassing information for some time. There is no indication that this will change; in fact, indicators point toward more emphasis in this area as reading comprehension, especially inferential comprehension, remains a central concern in education. The National Association of Educational Progress (Newsletter, 1981) reported that:

> Despite public fears, Johnny and Mary are reading better today--in the elementary classroom--than their counterparts at the beginning of the 1970s. And their older brothers and sisters in junior and senior high school are generally reading as well as their counterparts from the early seventies. . . .

> While 17-year-olds' performance nationally remained unchanged in the areas of literal comprehension and reference skills, their inferential comprehension skills suffered a significant decline-dropping by 2.1 percentage points between 1971 and 1980. (pp. 1, 2)

The study reported in this paper reported a difference, although not significant, in favor of the experimental group. This finding, in itself, suggests that additional work is needed concerning any relationship that might exist between schema theory, semantic webbing and inferential comprehension.

As usual there is a gap between theory, research and classroom application. More individuals need to continue to interpret schema theory and semantic mapping and webbing and to conduct research and develop classroom strategies. No doubt, refinements of the semantic webbing technique are possible and probably desirable.

More research is definitely needed. Larger studies with various types of subjects are needed. Presently, it is somewhat difficult to get school districts to participate in research programs and even more difficult to persuade them to allow an investigator to manipulate the curriculum over a period of time.

The use of different comprehension measures needs further consideration. The test used in this study is one of the few that divide reading comprehension into components. Tests need to be developed that evaluate the type of thinking processes that schema theorists believe need to occur in the reading process.

Concern over the differences between good and poor readers is always present. The teachers in this study were not of the same opinion as to the response that various levels of students had to the technique. It is very possible that the technique would be most valuable if it were not used so often in a reading program. Once students understand how it could help, they might use it as needed. Certain stories perhaps need the visually supported technique only on selected comprehension tasks rather than on all or many of them. The whole realm of various grade levels and reading levels needs to be explored in greater depth.

In general, the approach has begun to take its place among teaching techniques in various classrooms. Most who have worked with it see positive ways it can be used in reading. Therefore, more research is crucial so that if it is an effective technique it can be strengthened and be disseminated more widely, or if it is not a viable technique, it is not supported and disseminated.

SELECTED REFERENCES

Anderson, R.C. (1977). The notion of schemata and the educational enterprise. In R.C. Anderson, R.J. Spiro & W.W. Montague (Eds), Schooling and the acquisition of knowledge. Hillsdale, NJ: Erlbaum.

Anderson, R.C., & Kulhavy, R.W. (1972). Imagery and prose learning. Journal of Educational Psychology, 63, 242-243.

Anderson, R.C., & Hidde, J.L. (1971). Imagery and sentence learning. Journal of Educational Psychology, 62, 526-530.

Anderson, R.C., Reynolds, R.E., Schalbert, D.L., & Goetz, E.T. (1977). Frameworks for comprehending discourse. American Educational Research Journal, 14, 367-381.

Barlett, F.C. (1932). Remembering. Cambridge: University Press.

Bobrow, D.G., & Norman, D.A. (1975). Some principles of memory schemata. In D.G. Bobrow & A.M. Collins (Eds.), Representation and understanding: Studies in cognitive science. New York: Academic.

Bousfield, W.A. (1953). The occurrence of clustering in the recall of randomly arranged associates. The Journal of General Psychology, 49, 229-240.

Bower, G.H., Lisgold, A.M., & Tieman, D. (1969). Grouping operations in free recall. Journal of Verbal Learning and Verbal Behavior, 8, 481-493.

Bransford, J.D., & Johnson, M.D. (1973). Consideration of some problems of comprehension. In W.G. Chase (Ed.), Visual information processing. New York: Academic.

Bruner, J.S., & Potter, M.C. (1964). Interference in visual recognition. Science, 144, 424-425.

Carroll, J.B. (1964). Words, meanings, and concepts. Harvard Educational Review, 34, 178-202.

Chafe, W.L. (1976). Giveness, contrastiveness, definiteness, subjects, topics and points of view. In C.N. Li (Ed.), Subject and topic. New York: Academic.

Collins, A.M., & Loftus, E.F. (1975). A spreading-activation thery of semantic processing. Psychological Review, 82, 407-428.

Collins, A.M., & Quillian, M.R. (1970). Does category size affect categorization time? Journal of Verbal Learning, 9, 432-438.

Collins, A.M., & Quillian, M.R. (1969). Retrieval time from semantic memory. Journal of Verbal Learning and Verbal Behavior, 8, 240-247.

Crafton, L.K. (1983). Learning from reading: What happens when students generate their own background information? Journal of Reading, 26, 586-592.

Dale, E. (1965). Bibliography of vocabulary studies (5th ed.). Columbus: Ohio State University Press.

Dolch, E.W. (1953). Vocabulary development. Elementary English, 30, 70-75.

Durkin, D. (1978). Teaching them to read. Boston: Allyn & Bacon.

Elementary reading skills improve. (1981, Spring). NAEP Newsletter, pp. 1-3.

Farr, R., & Weintraub, S. (1973-74). Editorial: An argument for research. Reading Research Quarterly, 9, 131.

Freedman, G., & Reynolds, E.C. (1980). Enriching basal reader lessons with semantic webbing. The Reading Teacher, 33, 677-684.

Glass, G.V, & Stanley, J.C. (1970). Statistical methods in education and psychology. Englewood Cliffs, NJ: Prentice-Hall.

Hennings, D.G. (1982). A writing approach to reading comprehension--schema theory in action. Language Arts, 59, 8-17.

Johnson, D.D. (In press). An investigation of the effectiveness of vocabulary instruction on passage comprehension, research proposal. Madison: University of Wisconsin, Wisconsin Center for Education.

Johnson, D.D., & Pearson, P.D. (1978). Teaching reading vocabulary. New York: Holt, Rinehart & Winston.

Johnson, D.D., Toms-Bronowski, S., & Pittelman, S.D. (1982). Vocabulary development. The Volta Review, 84(5), 11-24.

Johnson, D.D., Pittelman, S.D., Toms-Bronowski, S., Chu-Chang, M., Tsui, G., Chun Yin, M., Uing Chien, C., & Chin, P. (1982). Studies of vocabulary development techniques in the United States of America and the Republic of China. Program Report 83-4. Madison: University of Wisconsin, Wisconsin Center for Education Research.

Karlin, R. (1980). Teaching elementary reading (3rd ed.). New York: Harcourt Brace Jovanovich.

Karlsen, B., Madden, R., & Gardner, E.F. (1976). Stanford diagnostic reading test: Manual for administering and interpreting. New York: Harcourt Brace Jovanovich.

Kintsch, W. (1978). Comprehension and memory of text. In W.K. Estes (Ed.), Handbook of learning and cognitive processes. Hillsdale, NJ: Erlbaum.

Kintsch, W. (1977). On comprehending stories. In M.A. Just & P.A. Carpenter (Eds.), Cognitive processes in comprehension. Hillsdale, NJ: Erlbaum.

Kintsch, W. (1974). The representation of meaning in memory. Hillsdale, NJ: Erlbaum.

Kintsch, W., & van Dijk, T. (1978). Toward a model of text comprehension and production. Psychological Review, 85, 363-394.

Labinowicz, E. (1980). The Piaget primer thinking-learning-teaching. Menlo Park: Addison-Wesley.

Langer, J.A. (1982). Facilitating text processing: The elaboration of prior knowledge. In J.A. Langer and M.T. Smith-Burke (Eds.), Reader meets author/bridging the gap: A psycholinguistic and sociolinguistic perspective. Newark, DE: International Reading Association.

Langer, J.A. (1981). From theory to practice: A preread-ing plan. Journal of Reading, 25, 152-156.

Language and the right brain: New Caltech findings. (1975, November). Brain/Mind Bulletin, p. 1.

Levin, J.R. (1976). Comprehending what we read: An outsider looks in. In H. Singer & R.B. Ruddell (Eds.), Theoretical models and processes of reading. Newark, DE: International Reading Association.

Levin, J.R. (1973). Inducing comprehension in poor readers: A test of a recent model. Journal of Educational Psychology, 65, 19-24.

Levin, J.R. (1972). When is a picture worth a thousand words? In Issues in imagery and learning: Four papers. Madison: Wisconsin Research and Development Center for Cognitive Learning.

Lindsay, P., & Norman, D. (1972). Human information processing. New York: Academic.

Lipson, M.Y. (1982). Learning new information from text: The role of prior knowledge and reading ability. Journal of Reading Behavior, 14, 243-261.

Manzo, A.V., & Sherk, J.C. (1971-72). Some generalizations and strategies for guiding vocabulary. Journal of Reading Behavior, 4, 81-88.

Massaro, D.W. (Ed.). (1975). Understanding language: An information processing analysis of speech perception, reading, and psycholinguistics. New York: Academic.

McNeil, J.D. (1980). How to teach reading successfully. Boston: Little, Brown.

Minsky, M. (1975). A framework for representing knowledge. In P.H. Winston (Ed.), The psychology of computer vision. New York: McGraw-Hill.

Moore, J., & Newell, A. (1973). How can Merlin understand? In L.W. Gregg (Ed.), Knowledge and cognition. Hillsdale, NJ: Erlbaum.

Norton, D.E. (1982). Using a webbing process to develop children's literature units. Language Arts, 59, 348-356.

Ornstein, R.E. (Ed.). (1973). The nature of human consciousness. San Francisco: Freeman.

Palmer, S.E. (1975). Visual perception and world knowledge: Notes on a model of sensory-cognitive interaction. In D.A. Norman, D.E. Rumelhart, & The LNR Research Group (Eds.), Explorations in cognition. San Francisco: Freeman.

Pearson, P.D., Hansen, J., & Gordon, C. (1979). The effect of background knowledge on young children's comprehension of explicit and implicit information. Technical Report 116. Urbana, IL: University of Illinois, Center for the Study of Reading.

Pearson, D.P., & Johnson D.D. (1978). Teaching reading comprehension. New York: Holt, Rinehart and Winston.

Perfetti, C.A., & Goodman, D. (1970). Semantic constraint on the decoding of ambiguous words. Journal of Experimental Psychology, 86, 420-427.

Pichert, J.W., & Anderson, R.C. (1977). Taking different perspectives on a story. Journal of Educational Psychology, 69, 309-315.

Rowher, W.D., Jr., & Matz, R. (1975). Improving oral comprehension in white and black children: Pictures versus print. Journal of Experimental Child Psychology, 19, 23-36.

Royer, J.M., Perkins, M.R., & Konold, C.E. (1979). Evidence for a selective storage mechanism in prose learning. Journal of Educational Psychology, 70, 457-462.

Rumelhart, D.E. (1975). Notes on a schema for stories. In D.G. Bobrow & A.M. Collins (Eds.), Representation and understanding: Studies in cognitive science. New York: Academic.

Rumelhart, D.E. (1981). Schemata: The building blocks of cognition. In J.T. Guthrie (Ed.), Comprehension and teaching: Research reviews. Newark, DE: International Reading Association.

Rumelhart, D.E., & Ortony, A. (1977). The representation of knowledge in memory. In R.C. Anderson, R.J. Spiro, & W.E. Montague (Eds.), Schooling and the acquisition of knowledge. Hillsdale, NJ: Erlbaum.

Shank, R.C, (1972). Conceptual dependency: A theory of natural language understanding. Cognitive Psychology, 3, 552-631.

Shank, R.C. (1982). Reading and understanding: Teaching from the perspective of artificial intelligence. Hillsdale, NJ: Erbaum.

Schweller, K.H., Brewer, W.F., & Dahl, D.A. (1976). Memory for illocutionary forces and perlocutionary effects of utterances. Journal of Verbal Learning and Verbal Behavior, 15, 325-337.

Sime, M. (1973). A child's eye view. New York: Harper & Row.

Smith, R.J., & Barrett, T.C. (1980). Teaching reading in the middle grades (2nd ed.). Reading, MA: Addison-Wesley.

Smith, R.J., & Johnson, D.D. (1980). Teaching children to read (2nd ed.). Reading, MA: Addison-Wesley.

Spilich, G.J., Vesonder, G.T., Chiesi, H.L., & Voss, J.F. (1979). Text processing of domain-related information for information for individuals with high and low domain knowledge. Journal of Verbal Learning and Verbal Behavior, 18, 275-290.

Stevens, K.C. (1982). Can we improve reading by teaching background information? Journal of Reading, 25, 326-329.

Stevens, K.C. (1980). The effect of background knowledge on the reading comprehension of ninth graders. Journal of Reading Behavior, 12, 151-154.

Thelen, J. (1982). Preparing students for content reading assignments. Journal of Reading, 25, 544-549.

Thomas, E.L., & Robinson, H.A. (1977). Improving reading in every class: A sourcebook for teachers (2nd ed.). Boston: Allyn & Bacon.

Thorndyke, P. (1977). Cognitive structures in comprehension and memory of a narrative disocurse. Cognitive Psychology, 9, 77-110.

Townsend, M.A.B. (1982). Flexibility of schema shifting in good and poor readers. Journal of Reading Behavior, 14, 169-177.

Tulving, E., & Pearlstone, Z. (1966). Availability versus accessibility of information in memory for words. Journal of Verbal Learning and Verbal Behavior, 5, 381-391.

van Dijk, T.A. (1977). Semantic macro-structures and knowledge frames in discourse comprehension. In M.A. Just & P.A. Carpenter (Eds.), Cognitive processes in comprehension. Hillsdale, NJ: Erlbaum.

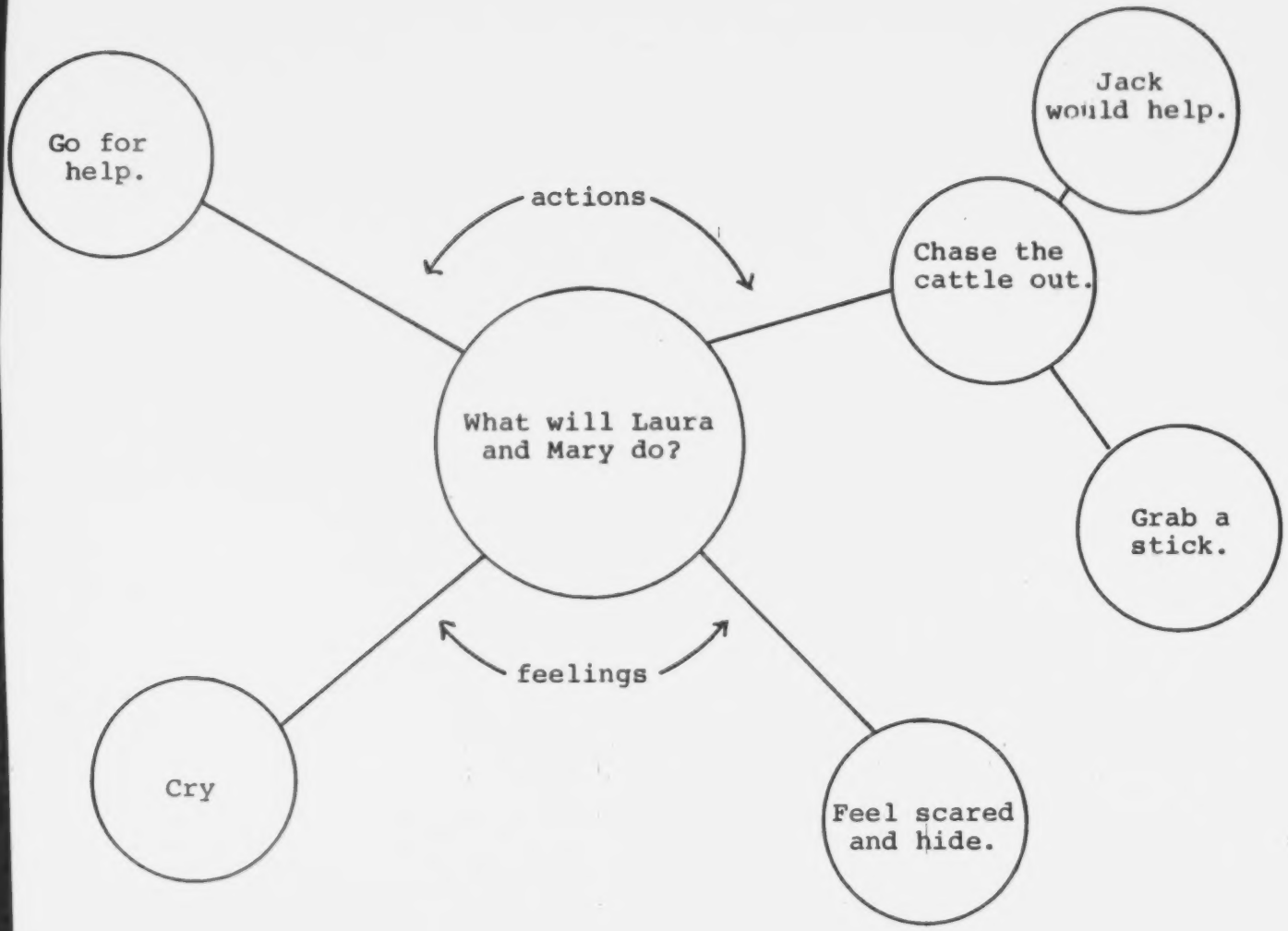
Willems, A., & Brown, M.H. (1980). Competency-based curricula: Another perspective. The Educational Forum, 44, 225-230.

Winograd, T. (1975). Frame representations and the declarative-procedural controversy. In D.G. Bobrow & A.M. Collins (Eds.), Representation and understanding: Studies in cognitive science. New York: Academic.

Wittrock, M.C., Beatty, J., Bogen, M.S., Gazzaniga, S., Jerison, H.J., Krashen, S.D., Nebes, R.D., & Teyler, T.J. (1977). The human brain. Englewood Cliffs, NJ: Prentice-Hall.

Wittrock, M.C. et al. (1975). Reading as a generative process. Journal of Educational Psychology, 67, 484-489.

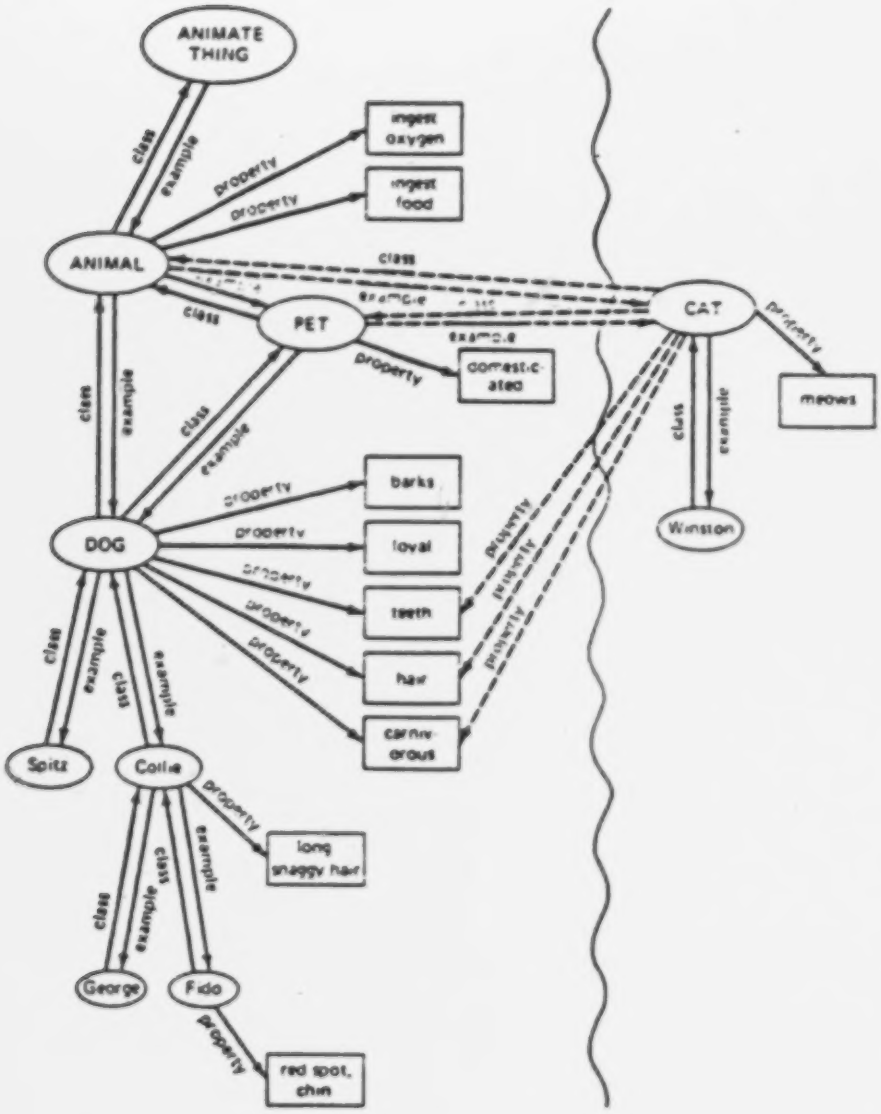
APPENDIX A


Go for help.
actions
Jack would help.
Chase the cattle out.
What will Laura and Mary do?
Grab a stick.
feelings
Cry
Feel scared and hide.

APPENDIX B

BEST COPY AVAILABLE

INCOMPLETE SEMANTIC MAP OF "DOG"*



*Johnson, D.D., & Pearson, P.D. (1978). Teaching reading vocabulary. New York: Holt, Rinehart and Winston, p. 36.

APPENDIX C

Features → / Words ↓	2 wheel	4 wheel	motor	passengers	rubber tires	handlebars	
bicycle	+	-	-	+	+	+	
car	-	+	+	+	+	-	
bus	-	-	+	+	+	-	
skateboard	-	+	-	-	-	-	

\+ = That feature is found in the word concept listed on the right.
\- = That feature is not found in the word concept listed on the right.

Johnson, D.D., & Pearson, P.D. (1978). Teaching Reading vocabulary. New York: Holt, Rinehart and Winston, p. 39.

APPENDIX D

Inservice Training

The following outline describes the basic material that was covered in the inservice training sessions.

I. Introduction to semantic mapping and semantic webbing. Materials were used from Pearson and Johnson (1978) and Freedman and Reynolds (1980). Definitions and examples as given in Chapter I in Definitions of Terms and in Appendices A and B were used. The concept of relating the student's background knowledge to the material to be read was emphasized. The concept of "building bridges" between the known and the unknown (Pearson and Johnson, 1978) was an integral part of this discussion. This concept was discussed in Chapter II. The similarities and differences of semantic mapping and semantic webbing were examined.

Copies of the article by Freedman and Reynolds (1980) were read and thoroughly discussed during the inservice time. This material was the basis for building lessons using semantic webbing.

II. The structure of a lesson using semantic webbing. The teaching procedure using semantic webbing would include the teacher introducing the topic or selection to be read. Through discussion, the teacher and students would build a background or introduction to the story. By analyzing each student's contributions to the discussion, the teacher would become aware of the amount and quality of information each

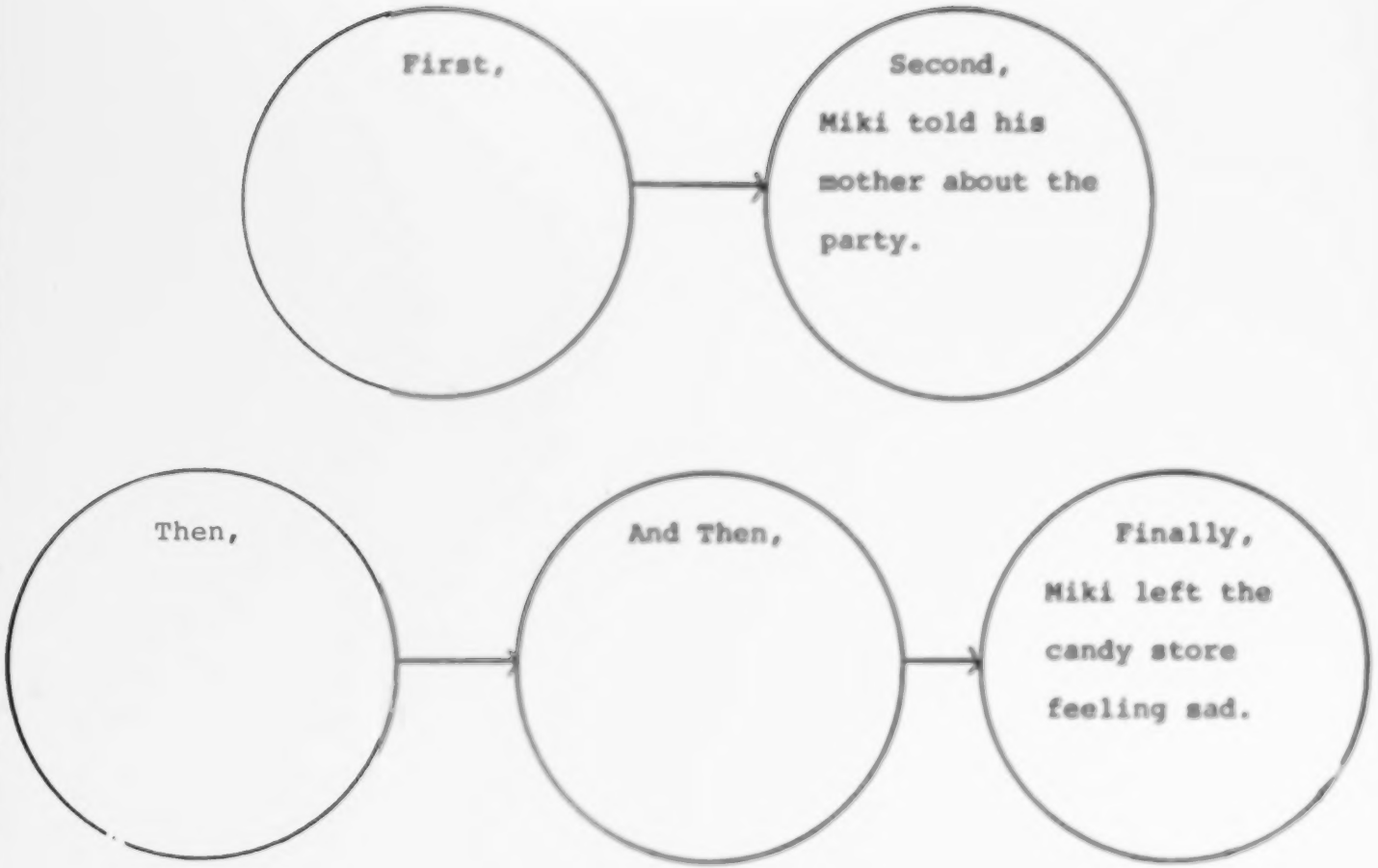
student possessed about the topic. He/she would then use this information to determine if each student had a sufficient background to understand the reading selection. If necessary, the teacher and students would use other materials to build a sufficient background if one did not already exist. Working with the students, the teacher would set up the graphics of a webbing (see Appendices A and E) for each major question or investigation that was going to be answered. During silent reading or immediately afterwards, the students would add possible answers to the web. A general discussion would follow in which the teacher and students would work for closure and analyze the responses and their relationships within the webbing process or graphics for each question.

III. Building lessons using semantic webbing. During the inservice, training selections from basal readers were used by the group as practice in structuring lessons utilizing the semantic webbing technique. Open discussion helped the teachers evaluate their lessons as they suggested various ideas. The Freedman and Reynolds (1980) article served as the basis for the lessons and discussions.

APPENDIX E

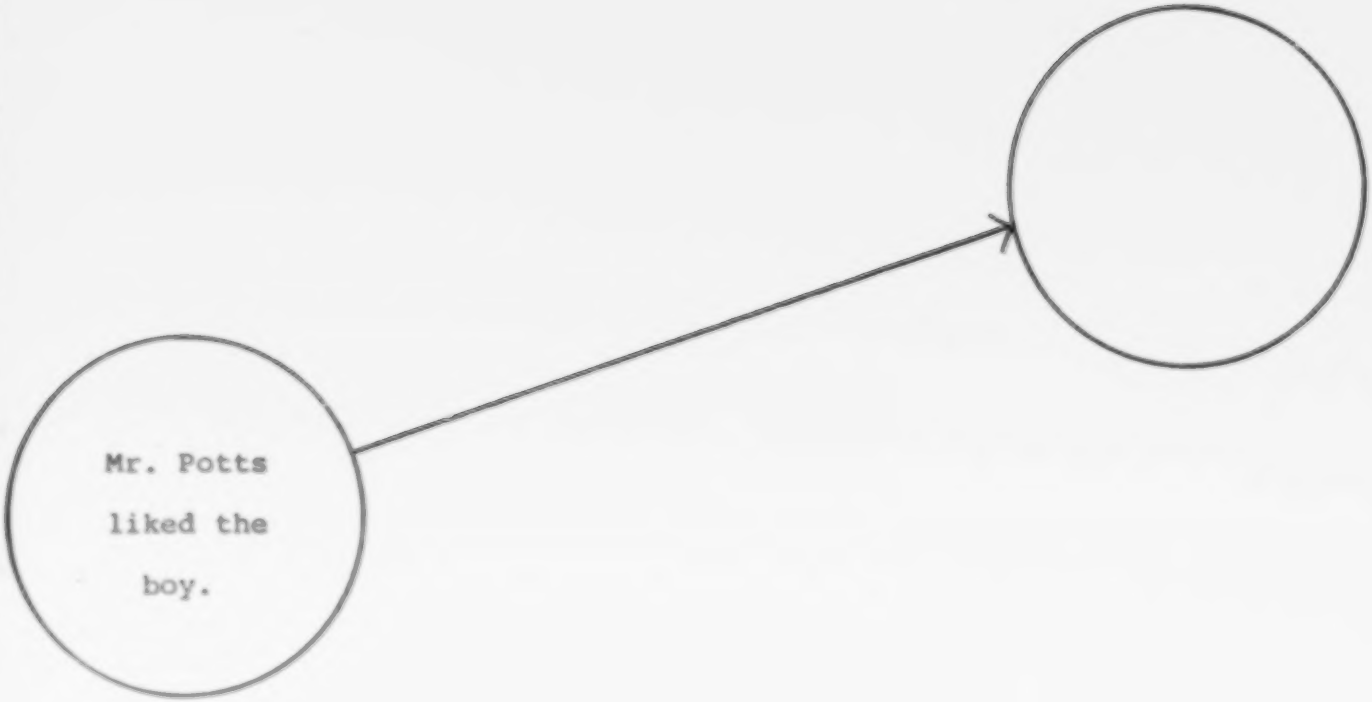
(The examples of semantic webbing that are included in this section are not meant to represent all reading skills equally but rather to show the various graphic forms that the webbing can take. Many are related to the theme of the reading selection; others are more geometric in origin.)

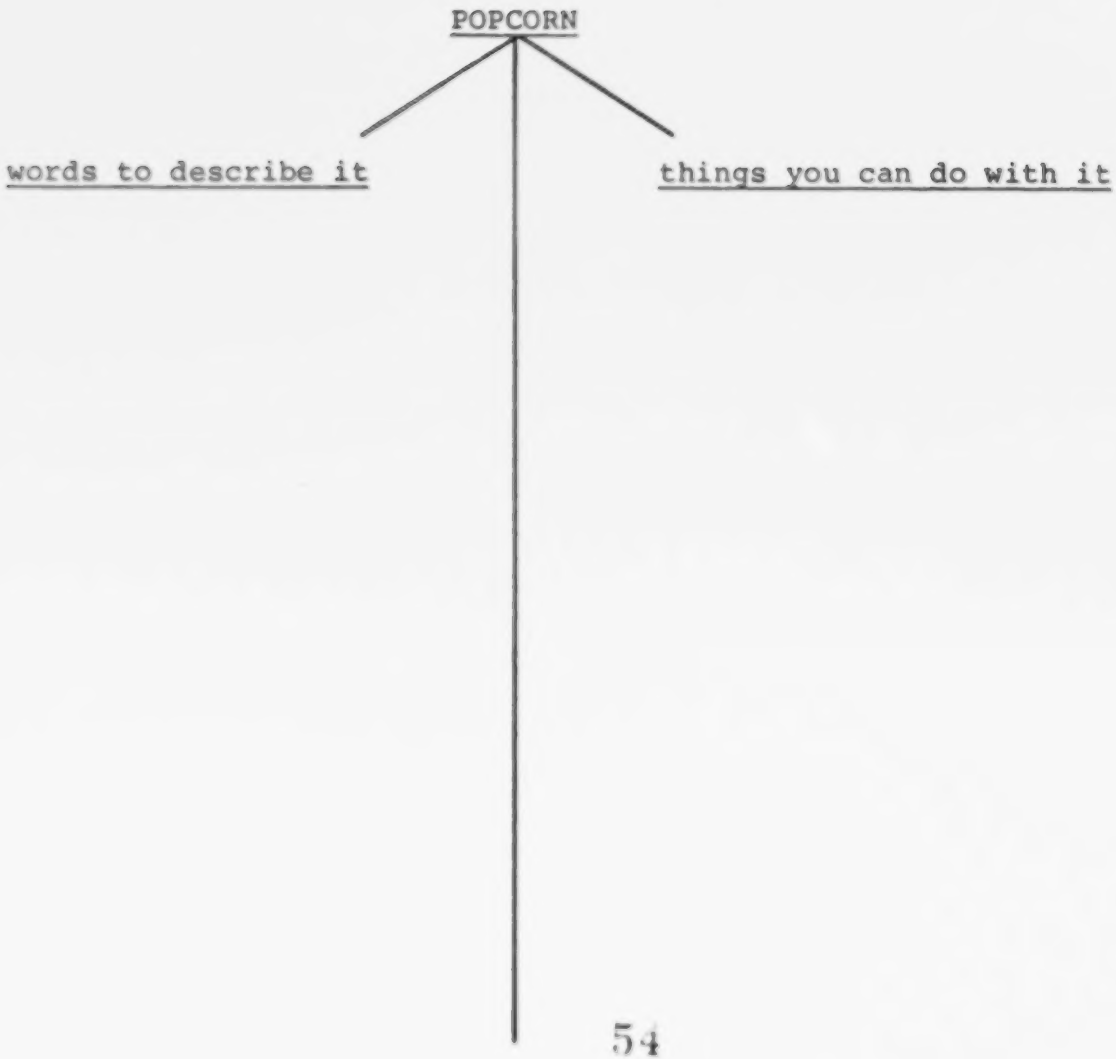
SEQUENCE


First,
Second,
Miki told his mother about the party.
Then,
And Then,
Finally,
Miki left the candy store feeling sad.

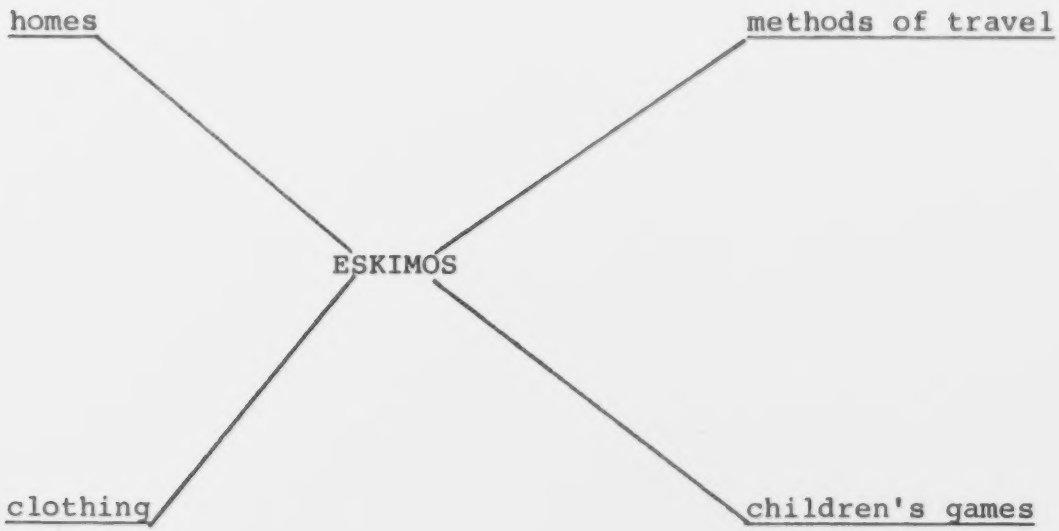
Name 3 characters in "Meet Miki Tabino" and tell something about each one.

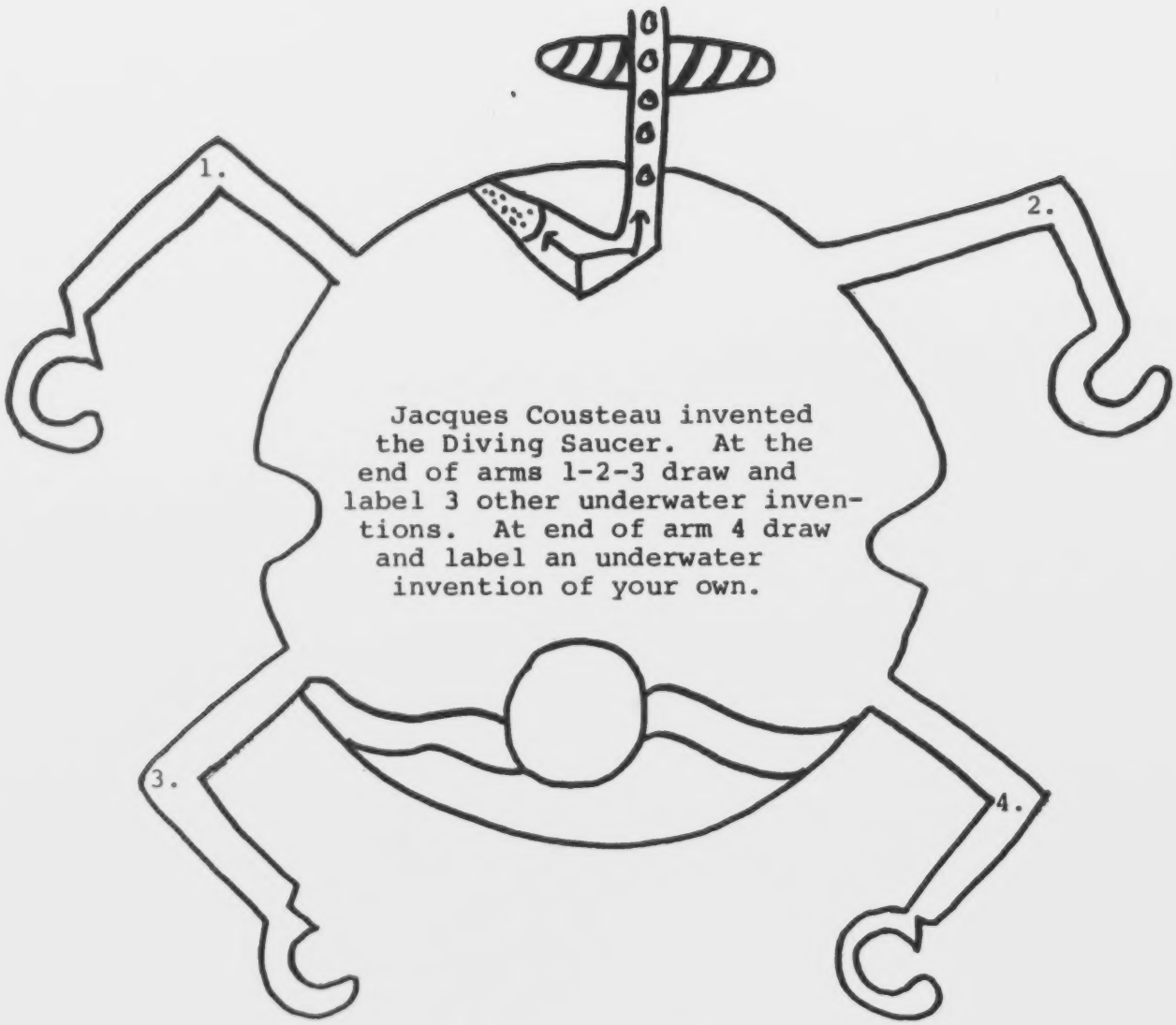
CAUSE AND EFFECT

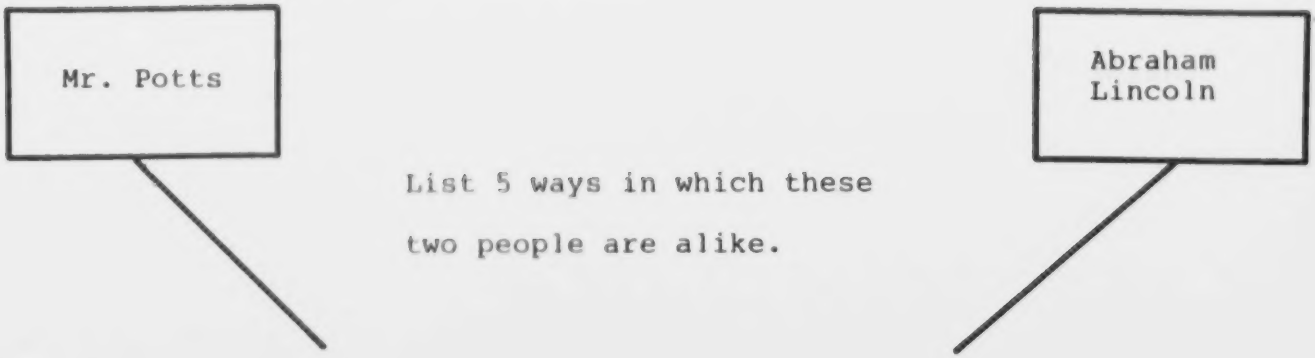



POPCORN
words to describe it
things you can do with it

Pitseolak: Pictures Out of My Life




1.
2.
Jacques Cousteau invented the Diving Saucer. At the end of arms 1-2-3 draw and label 3 other underwater inventions. At end of arm 4 draw and label an underwater invention of your own.
3.
4.



List 5 ways in which these two people are alike.

1. _____

2. _____

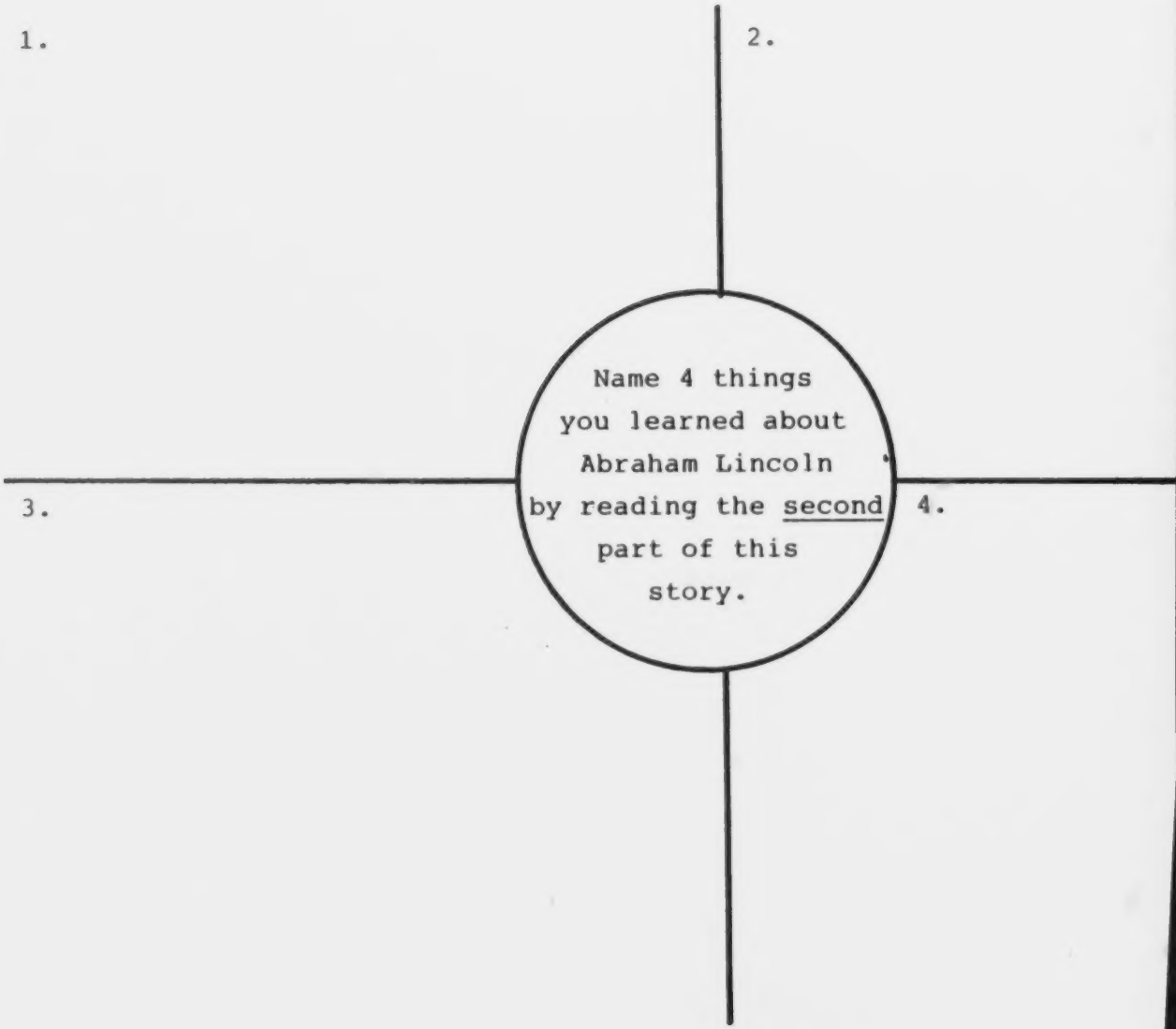
3. _____

4. _____

5. _____

58

59


1.
2.
Name 4 things you learned about Abraham Lincoln by reading the second part of this story.
3.
4.

APPENDIX F

The evaluations of the six teachers in the study are as follows:

1. Teacher A: The technique was fine for the first three or four weeks. The better readers enjoyed it. Those less capable students who got tired of it, get tired of anything. I would recommend not using it so often. At the beginning it was difficult. As they got used to it they liked the idea that they could each respond. They wanted to alternate between using the technique as a group with the teacher using the board for responses and doing the technique individually. I think it's worthwhile.

2. Teacher B: The students really liked it at first for about four weeks then they grew tired of it. It was a learning experience for them and was enjoyable. Like anything it is too much if it is done all the time. As a teacher, I really like it. It seemed to work fine with all levels of readers. Even when a student had trouble this technique was easier for him than any other. The brighter kids really liked it. They could take it and really go on and on with it.

3. Teacher C: The students liked it. They got tired of it. If it were done less often it would probably be better. The students did better on detail rather than on opinion questions or others that needed a statement for an answer. They liked short answers better.

4. Teacher D: At first the students were really not sure of what they were to do, that might have been my fault. Later they sometimes really enjoyed it; it seemed to depend on the story. They got very good with the technique by the end. One student liked it because it "drew a picture of the story." The students were tired of using it so much. I want to use it more, but it does take teacher preparation.

5. Teacher E: At first the students had to get used to it. The more advanced readers really took off. The lower ability students needed more help. I often did the writing. It helped my kids because they need visual and multi-sensory approaches. I liked it for the more capable students. The inferential area was more difficult for the less able readers. It could work into mastery centers.

6. Teacher F: Even though I had learned about semantic webbing prior to Mina Bayne's research study, I had never felt comfortable using this technique in my classroom. Having been "forced" to use it for purposes of this study, I have found webbing to be a practical, helpful and different approach to teach many comprehension skills including careful reading of materials, retention of important facts and sequence of a story, knowledge of relationships between story and characters. I will continue to use semantic webbing in my classroom.

The use of semantic webs was new to the students also. Some children understood them almost immediately; others at

first seemed to be genuinely confused with this use of visual aids in comprehension. After getting familiar with their purpose, the students seemed to like them a lot--especially if we discussed them as a group.